



COMMONWEALTH OF MASSACHUSETTS

Deval L. Patrick, Governor  
Richard K. Sullivan, Jr., Secretary  
Mark Sylvia, Commissioner

## Behavioral Energy Efficiency Programs

DOER Green Communities Webinar

January 8, 2014

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## Green Communities Division

Serves as the hub for all Massachusetts cities and towns on energy matters



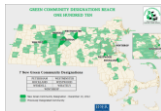
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## Green Communities Division Programs & Resources for Municipalities

- Green Communities Designation and Grant Program
- MassEnergyInsight energy tracking tool
- Municipal Energy Efficiency Program
- Energy Management Services Technical Assistance (EMS)
- Mass Municipal Energy Group (MMEG)
- Website filled with tools & resources - [www.mass.gov/doer](http://www.mass.gov/doer)
- Email updates via listserv – Sign up by sending an email to: [join-ene-greencommunities@listserv.state.ma.us](mailto:join-ene-greencommunities@listserv.state.ma.us)



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## Outreach - Regional Coordinators

- Regional Coordinators act as direct liaisons with cities and towns on energy efficiency and renewable energy activities
- Located at each of the DEP Regional Offices:



SERO – LAKEVILLE: Seth Pickering  
[Seth.Pickering@state.ma.us](mailto:Seth.Pickering@state.ma.us)

NERO – WILMINGTON: Joanne Bissetta  
[Joanne.Bissetta@state.ma.us](mailto:Joanne.Bissetta@state.ma.us)

CERO – WORCESTER: Kelly Brown  
[Kelly.Brown@state.ma.us](mailto:Kelly.Brown@state.ma.us)

WERO – SPRINGFIELD: Jim Barry  
[Jim.Barry@state.ma.us](mailto:Jim.Barry@state.ma.us)



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## Recording & Presentation

- The webinar is being recorded and will be available on our website in approximately 48 hours at:  
[www.mass.gov/energy/greencommunities](http://www.mass.gov/energy/greencommunities)
- The slide presentation will also be posted at:  
[www.mass.gov/energy/greencommunities](http://www.mass.gov/energy/greencommunities)
- Website and contact information is listed at end of presentation



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## Considerations on Behavioral Energy Efficiency Programs

Aimee Powelka  
Municipal Efficiency Coordinator  
Green Communities Division, DOER

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## Behavior ≠ Education & Awareness

- Energy education has been ongoing since 1970s energy crisis, yet there are still lots of efficiency opportunities (i.e., energy waste)
- Why not efficiency?
  - Awareness
  - Barriers
  - Benefits

Reference:  
Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing  
Doug McKenzie-Mohr & William Smith



Image courtesy of koratmember/FreeDigitalPhotos.net



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## Tools and Resources: Community-Based Social Marketing



Source: www.cbsm.com



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## Residential Behavioral Programs Look Promising



- Behavioral programs have been shown to be **cost-effective**
- **MA utilities** are using programs such as OPower (CLC and NGrid)
- Behavioral programs have **significant potential**

Source: [www.opower.com/beepotential](http://www.opower.com/beepotential)



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## MA Utilities Are Using Residential Behavioral Programs

Program Administrator	Implementer	Cohort	Fuel Type
National Grid	OPower	2009	Electric
National Grid	OPower	2009	Electric
National Grid	OPower	2010	Electric
National Grid	OPower	2010	Electric
National Grid	OPower	2010 Add	Electric
National Grid	OPower	2011	Electric
National Grid	OPower	2009	Gas
National Grid	OPower	2009	Gas
National Grid	OPower	2010	Gas
National Grid	OPower	2011	Gas
NSTAR	OPower	Wave I	Gas
NSTAR	OPower	Wave II	Gas
WMECO	CS	Report-Positive	Electric
WMECO	CS	Report-Active	Electric
WMECO	CS	Not Report-Active	Electric

- **National Grid, NSTAR and WMECO** have piloted and/or are using residential behavioral programs
- Evaluation report published July 2012

- Key findings:

- Opt-in programs generate higher relative savings per household
- Opt-out programs save more overall due to greater reach
- Electric programs generate more savings, on average, than gas programs using the same model
- **Energy savings persist and GROW** with continued treatment into 2<sup>nd</sup> year

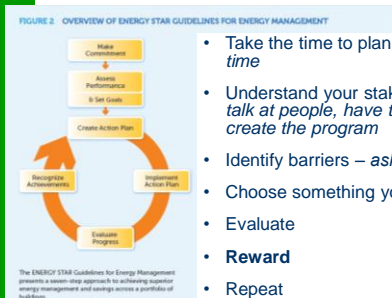
Source: [http://opower.com/uploads/library/file/19/MA\\_Three\\_Year\\_Cross-Cutting\\_Behavioral\\_Program\\_Evaluation\\_Integrated\\_Report\\_072512.pdf](http://opower.com/uploads/library/file/19/MA_Three_Year_Cross-Cutting_Behavioral_Program_Evaluation_Integrated_Report_072512.pdf)



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## Behavioral Program Steps



- Take the time to plan – *it takes a lot of time*
- Understand your stakeholders – *don't talk at people, have them help you create the program*
- Identify barriers – ask “why” questions
- Choose something you can *measure*
- Evaluate
- **Reward**
- Repeat

Source: [http://epa.gov/statelocalclimate/documents/pdf/k-12\\_guide.pdf](http://epa.gov/statelocalclimate/documents/pdf/k-12_guide.pdf)



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## Key Strategies for Commercial Behavioral Programs

- Strong support from upper management
- Program branding
- Building a team with stakeholders
- Peer champions from building occupants
- Many and varied communication tools
- Engagement techniques such as feedback, benign peer pressure, competition, rewards and reference to social norms



Image courtesy of keerat/FreeDigitalPhotos.net

Source: <http://www.aacee.org/sites/default/files/publications/researchreports/h121.pdf>



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## Cambridge GreenSense

DOER Green Communities Webinar

January 8, 2014

**Ellen Katz**  
Fiscal Director  
Cambridge Department of Public Works  
Cambridge, MA

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## Powering Down and Behavioral EE in Schools

DOER Green Communities Webinar

January 8, 2014

**Kate Crosby**  
Energy Manager  
Acton-Boxborough Regional School District  
Acton, MA

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## Thank You

- Ellen Katz
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  - Cambridge Department of Public Works
  - [ekatz@cambridgema.gov](mailto:ekatz@cambridgema.gov)
  - Tel: (617) 349-6956
- Kate Crosby
  - Energy Manager
  - Acton Public Schools/Acton-Boxborough Regional School District
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  - [kcrosby@abschools.org](mailto:kcrosby@abschools.org)
  - [ab.mec.edu/departments/facilities/facilities.shtml](http://ab.mec.edu/departments/facilities/facilities.shtml)
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  - 617-626-7356



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## Resources

- **National Grid Customers:** See the Light behavioral program
- **Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing** by Doug McKenzie-Mohr & William Smith
  - [www.cbsm.com](http://www.cbsm.com)
  - [www.opower.com/beepotential](http://www.opower.com/beepotential)
  - [http://opower.com/uploads/library/file/19/MA\\_Three\\_Year\\_Cross-Cutting\\_Behavioral\\_Program\\_Evaluation\\_Integrated\\_Report\\_072512.pdf](http://opower.com/uploads/library/file/19/MA_Three_Year_Cross-Cutting_Behavioral_Program_Evaluation_Integrated_Report_072512.pdf)
  - [http://epa.gov/statelocalclimate/documents/pdf/k-12\\_guide.pdf](http://epa.gov/statelocalclimate/documents/pdf/k-12_guide.pdf)
  - <http://www.aceee.org/sites/default/files/publications/researchreport/s/b121.pdf>



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## Cambridge GreenSense

**Ellen Katz**  
City of Cambridge  
January 13, 2014



## Goals

- Reduce energy consumption in City facilities
- Save money
- Minimize City's environmental footprint
- Advance City's role as a "green" leader



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## The Case for Energy Awareness

5 to 15% energy use is under occupant control

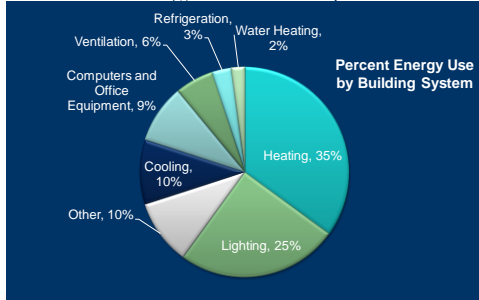


Chart: EERE Advanced Energy Retrofit Design Guide for Office Buildings, 2011  
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## Planning Stage

- Planning group from several departments: "Understand your stakeholders"
- Requires staffing! Led by DPW
- Takes time! Met regularly for several months.

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## Branding



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## Select Target Behavior

Measurable

Keep it Simple

Surveyed 10 buildings after hours:

- Fire HQ
- Office building



- Branch library
- Public Works garage

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## Findings

– Lights on after-hours:



- Common areas
- Hallways
- Stairwells
- Restrooms
- Kitchen areas
- Offices

– Computers on after hours:

- 53% computers on
- 46% monitors on



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## Implemented

- Support from upper management
- Volunteer Energy Champions
- Kick off meeting – City Manager welcome
- Two options – AM/PM
- Supplies:
  - T-shirts
  - Posters
  - Labels for light switches



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Use Less. Gain More.



## Report Results

City/Dept	10/1/07	10/1/08	10/1/09	10/1/10	%
Engine 2	17,172	17,964	14,517	-3,047	-17%
Engine 3	22,640	30,560	25,600	-4,960	-16%
Engine 4	9,680	11,080	9,160	-1,920	-17%
Engine 5	10,440	11,092	13,801	2,509	23%
Engine 6	7,538	8,067	6,764	-1,303	-16%
Engine 8	21,360	22,800	18,840	-3,960	-17%
Engine 9	5,707	6,179	6,002	-177	-3%
<b>Engine</b>	<b>108,000</b>	<b>120,110</b>	<b>107,000</b>	<b>-2,000</b>	<b>-2%</b>
E. Cambridge Parking Garage	135,840	126,440	127,643	1,203	1%
Electrical Dept. Garage	7,631	10,503	8,017	-2,486	-24%
Green Street Garage	36,800	38,400	37,000	-1,400	-4%
Police Maintenance Garage	5,691	5,473	5,224	-249	-5%
<b>Garage</b>	<b>176,000</b>	<b>169,800</b>	<b>167,800</b>	<b>-2,000</b>	<b>-1%</b>
Central Sq. Branch	14,640	16,080	14,640	-1,440	-9%
Heritage Branch	4,447	4,245	3,650	-595	-14%
Mt. Auburn Branch	3,552	3,298	2,601	-697	-21%
No. Camb. Branch	8,634	2,436	7,316	4,888	200%
Observatory Branch	6,345	4,689	4,400	-289	-6%
Valente Branch	9,784	9,002	8,482	-520	-6%
<b>Police Branch</b>	<b>47,000</b>	<b>33,000</b>	<b>33,000</b>	<b>-2,000</b>	<b>-4%</b>
City Hall	190,080	192,732	187,352	-25,380	-13%
City Hall Annex (McCusker Bldg)	123,640	148,920	122,520	-26,400	-18%
Cotton Building	72,960	69,520	65,120	-4,400	-6%
Danahy Park Comfort Station	10,139	17,242	15,404	-1,838	-11%
Emergency 911	57,416	65,950	92,827	3,123	3%
Fire Headquarters	20,602	22,747	17,886	-4,761	-21%
Lombardi Building	63,150	78,990	68,070	-10,920	-14%



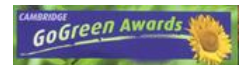
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## Acknowledge

- GoGreen Awards
- PIO Updates
- Intranet Site



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## GreenSense 2.0: Waste



Reduce paper use 10%:  
Just 9 pieces per week!



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OFFICE SUPPLY  
TRADING POST



Opt out of junk mail  
Use Less. Gain More.



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## Lessons Learned

- Changing the culture
- Leaders emerge:
  - Fire Department, Assessor's, City Clerk's office
- Don't worry about reaching everyone
- Include custodians



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Use Less, Gain More



## Thank you for your time!

Ellen Katz  
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Cambridge GreenSense



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# POWERING DOWN:

A TOOLKIT FOR BEHAVIOR-BASED ENERGY CONSERVATION IN K-12 SCHOOLS

Kate Crosby, Energy Manager  
Acton-Boxborough Regional School District

# POWERING DOWN:

A TOOLKIT FOR BEHAVIOR-BASED ENERGY CONSERVATION IN K-12 SCHOOLS



THE CENTER FOR GREEN SCHOOLS



www.centerforgreenschools.com | Issues/Resource Documents/Behavior-based Efficiency Toolkit



School	Drop in Electricity Use Due to Behavior-based Energy Conservation Strategies					Baseline year
	Annual reduction in electricity usage (vs. baseline year)		Annual cost savings (vs. baseline year)		Length of time covered by energy data	
	%	kilowatt-hour (kWh)	%	\$		
Holston MS Knoxville, TN	-37%	-848,929	-12%	-\$19,816	6 years	FY2007
Rosa Parks ES Lexington, KY	-36%	-645,900	-20%	-\$24,500	4 years	FY2009
Laguna Creek HS Elk Grove, CA	-30%	-663,232	-19%	-\$47,704	4 years	FY2009
Henderson HS West Chester, PA	-30%	-1,359,672	-27%	-\$119,491	5 years	CY2008
John Jacobs ES Phoenix, AZ	-20%	-250,797	-10%	-\$12,463	5 years	Mar, 2007 - Feb, 2008

## THREE COMPLEMENTARY AVENUES

- Raising awareness among faculty, staff, students
- Managing school building operations
- Upgrading mechanical equipment and controls



Sample successful, Cross-Sectoral, Organizational Culture Intervention for Energy Conservation: Pierce interview, Pierce interview



## ENERGY USE IN SCHOOLS

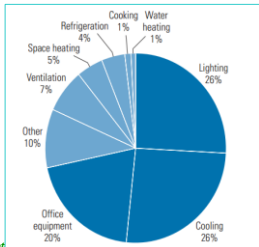
(and other “commercial” buildings):

- HVAC
- Lighting (25-50% of electricity)
- Plug load (25% of electricity?)

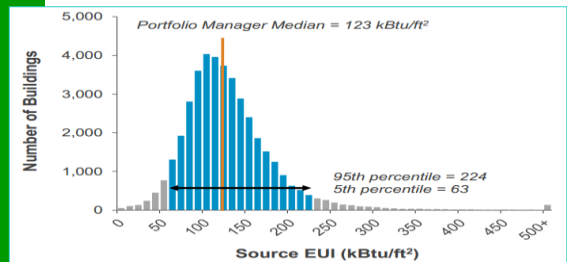
The chart shows a sample profile of electricity use within a school. Actual data will differ depending on location & climate.



Helping Massachusetts



US EPA, Energy Star Building Upgrade Manual (2008)



The least efficient school buildings use **four times** more energy per square foot than the most efficient ones. Older schools can sometimes be very energy efficient – the way in which a school building is managed has a big influence on how it stacks up.

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## BENEFITS OF BEHAVIOR-BASED PROGRAMS



Credit: Aaron Beinhorn Regional School District

- COST SAVINGS
- REDUCED ENVIRONMENTAL IMPACT
- LEARNING & LEADERSHIP OPPORTUNITIES FOR STUDENTS



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## EFFECTIVE PROGRAMS



Credit: Powers County Public Schools

### SCHOOL DYNAMICS

- Committed faculty/staff leader(s)
- Principal/administrator: essential support & endorsement
- Student engagement: energy, creativity, positive focus
- Custodial staff included

### DISTRICT SUPPORT

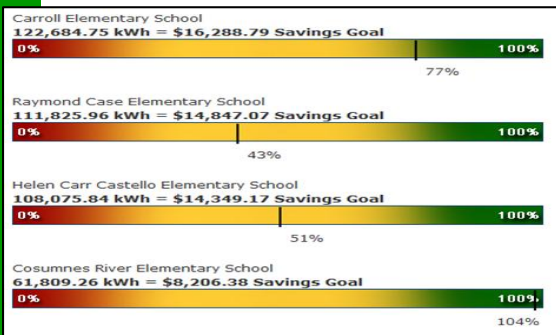
- Essential support: Tracking energy use → sharing feedback
- Additional support variable: recognition program, assistance with identifying priorities, signage, equipment loans, educational resources
- Can be homegrown or incorporate 3<sup>rd</sup> party assistance (emphasis on capacity-building and savings retained in district)

### MOMENTUM

- Energy data cited by faculty/staff as compelling and strongly motivating
- Cost savings highly valued → educational resources
- Recognition highly valued

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Energy data & progress toward goals in web-based format  
Elk Grove Unified School District: [www.egusd.net/energy/savin](http://www.egusd.net/energy/savin)



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“Once [Facilities] was putting out the graphs showing how much we were saving each month, I think that was really key. People could see that last month we went down \$12,000 from the previous year, and all that we’re doing is turning our lights out when we leave the room. So it made a big difference that people could see the changes.”



-Faculty member, Laguna Creek School

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"The students leave notes as they check in the morning, like 'Thank you for turning your lights out.' It's just a reminder to teachers, and the teachers think it's fun and the kids get a kick out of it... When you come back and you get the note that you've been busted, you laugh about it but it does kind of put a little nugget in your head that says, 'Okay, I really need to start doing this.'"

-Principal, Rosa Parks Elementary School



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E=USE <sup>2</sup> Classroom Checklist	
	<b>Lights out</b> <ul style="list-style-type: none"> <li>Before school</li> <li>After school</li> <li>Recess</li> <li>Lunch</li> </ul>
	<b>Computer monitors &amp; printers off</b> <ul style="list-style-type: none"> <li>when not in use</li> </ul>
	<b>Personal appliances off</b> <ul style="list-style-type: none"> <li>when not in use</li> </ul>
	<b>Doors closed</b> <ul style="list-style-type: none"> <li>During class</li> <li>When room is unoccupied</li> </ul>
	<b>Windows closed</b> <ul style="list-style-type: none"> <li>When heat or cooling on</li> </ul>
	<b>WATTY says . . .</b> <ul style="list-style-type: none"> <li>Lights off when sun provides enough light</li> <li>Blinds closed to reduce heat from sun on warmer days</li> <li>Blinds open to admit heat from sun on cooler days</li> <li>Thermostat No electronic equipment within five feet</li> </ul>

Credit:  
Fayette County  
Public Schools

"To really get a successful conservation program in place, you have to engage with the children directly because they drive it every day—they practice it continuously."



- Energy Manager, Knox County Schools

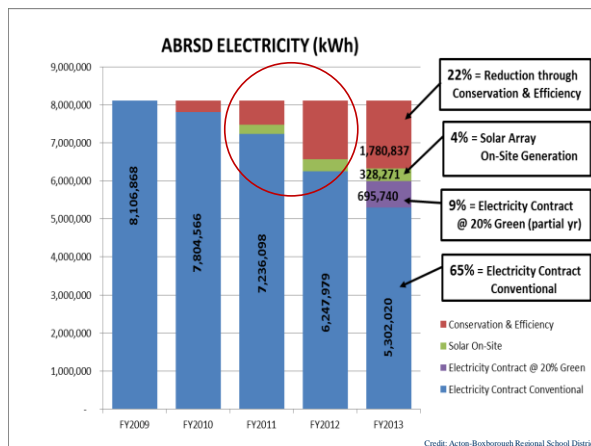
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ACTON-BOXBOROUGH REGIONAL SCHOOL DISTRICT

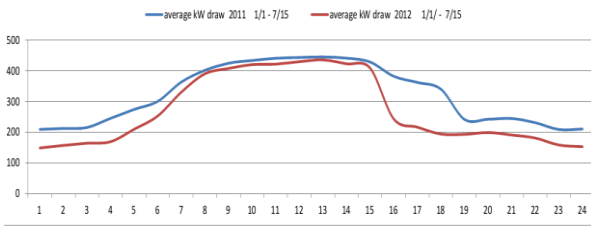


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## REDUCTION IN DEMAND (kW)

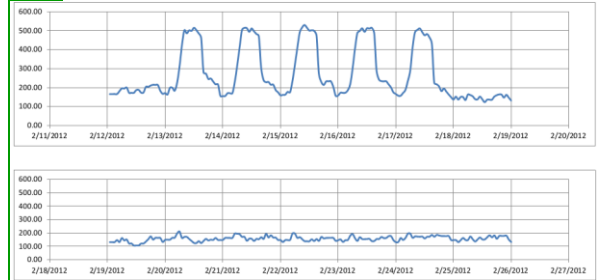


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Credit: Acton-Bosborough Regional School District

## VACATION SHUTDOWN

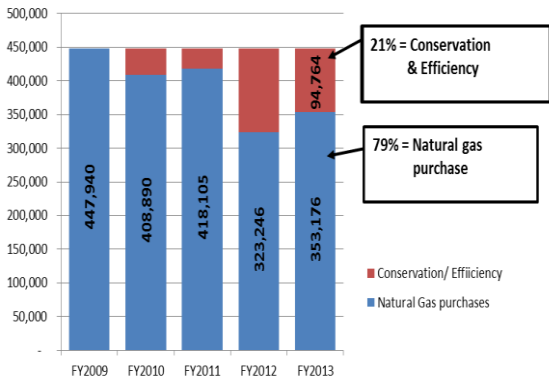


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Credit: Acton-Bosborough Regional School District

## ABRSD NATURAL GAS (therm)



Credit: Acton-Bosborough Regional School District



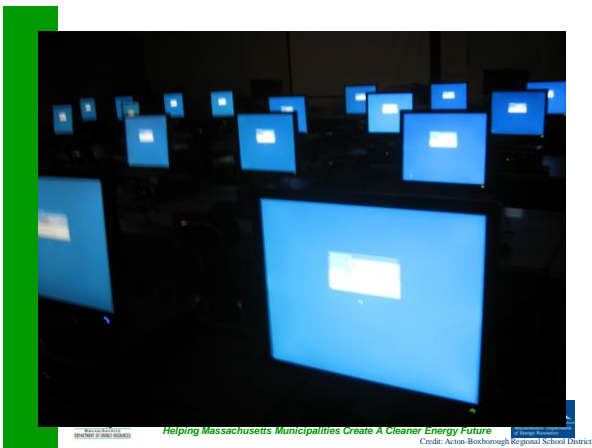
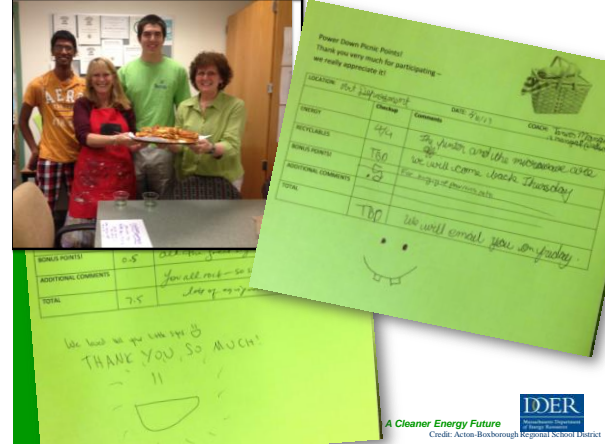
Credit: Acton-Bosborough Regional School District



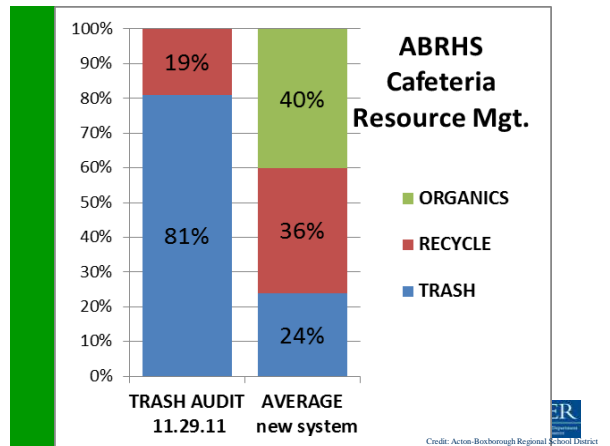
Credit: Acton-Bosborough Regional School District



Credit: Acton-Bosborough Regional School District









Credit: Acton-Busborough Regional School District



International "Green Flag" award, Eco-Schools  
Helping Massachusetts Municipalities Create A Cleaner Energy Future  
Credit: Acton-Busborough Regional School District



US EPA ENERGY STAR award to most of our schools  
the rest to follow  
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Credit: Acton-Busborough Regional School District



U.S. Department of Education  
2013  
Helping Massachusetts Municipalities Create A Cleaner Energy Future  
Credit: Acton-Busborough Regional School District

Buildings have their own hidden curriculum that teaches as effectively as any course taught in them. Lessons are taught by the way we design, build, and operate academic buildings?



-David Orr, *Earth in Mind*  
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